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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/566,401	01/30/2006	Marcello Notari	284318US0XPCT	3724
22850	7590	09/17/2009		
OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, L.L.P. 1940 DUKE STREET ALEXANDRIA, VA 22314				
EXAMINER TISCHLER, FRANCES				
ART UNIT		PAPER NUMBER		
1796				
NOTIFICATION DATE		DELIVERY MODE		
09/17/2009		ELECTRONIC		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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### Office Action Summary

**Application No.**

10/566,401

**Applicant(s)**

NOTARI ET AL.

**Examiner**

FRANCES TISCHLER

**Art Unit**

1796

**Period for Reply** -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 06 July 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☐ Claim(s) 21-32, 34 and 36-44 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 21-32, 34 and 36-44 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SI-108)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 7/6/09 has been entered.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

### ***Claim Rejections - 35 USC § 103***

**Claims 21, 22, 26 – 32, 34, 36 – 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shingo (JP 11080418) in view of Cohen (4,405,394).**

Regarding claims 21, 22, 28, 34, 36 - 41: **Shingo** discloses (abstract, [007], claims 1 and 2) of a process for recycling foamed polystyrene by dissolving it in diethyl carbonate, reading on Applicant's dialkyl carbonates. Shingo discloses ([0012], [0016]) that the impurities are removed as claimed by Applicant; the polystyrene is recovered with a non-solvent and by stirring until the polystyrene precipitates; the polymer is separated and filtered from the mixed liquor for reuse. Separating the liquid from the

precipitate implies drying where, without further limitation to the drying process, a precipitate will eventually dry.

Shingo is silent as to temperature or pressure of the process, implying that the process takes place at room temperature and at atmospheric pressures, reading on Applicant's temperatures and pressures.

Shingo discloses ([0016], [0019]) an example using 25g (0.2 mole) diethyl carbonate solvent and 20g (0.6 mole) methanol non-solvent, or a 3:1 ratio of non-solvent to dialkyl carbonate, reading on Applicant's range. It is also noted that one of ordinary skill in the art would know how much non-solvent to add until precipitation is occurs.

Shingo discloses (abstract, [0007], [0008], [0011], [0012], claims 2 and 5) the use of alcohol, such as n-butanol, iso-propanol, etc., as a deposit agent (the word used by the machine translation) to deposit (i.e. to precipitate) the polystyrene, but fails to disclose the combination of alcohol with alkylene carbonate as the non-solvents.

**Cohen** discloses (3:8 – 15, 5:37 – 45, 8:65 – end, claims 1, 4, 14, 15) a laminating process by applying a polystyrene layer onto a layer of liquid, where the liquid layer is a non-solvent for the polymer, such as water, alcohol, alkylene carbonate such as ethylene carbonate, etc., or combinations of said non-solvents.

It would have been obvious to one of ordinary skill in the art to have added an alkylene carbonate to Shingo's alcohol for the same purpose of precipitating the polystyrene, since Cohen teaches that alcohol and alkylene carbonates are equivalent and can be used interchangeably or in combination, and since both compounds are

similar in that they exhibit non-solvent characteristics towards polystyrene in order to precipitate said polystyrene from solution.

Regarding claims 26 and 27: Shingo discloses ([0012]) a polystyrene concentration of 15 – 40%, and an example ([0016]) of 16.7%, reading on Applicant's range.

Regarding claims 29 and 30: Shingo is silent as to the feeding of the solution into the bottom of the reactor. However, it would have been obvious to one of ordinary skill in the art to introduce the polystyrene or the non-solvent into the reactor at a particular section of the reactor which would optimize the engineering of stirring.

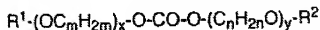
Regarding claims 31 and 32: Shingo is silent on the flow rate of adding polystyrene into the solvent. However, the flow rate can be optimized through routine experimentation to achieve proper mixing and precipitating and one of ordinary skill in the art would have been able to choose the optimum range.

Regarding claim 41: Shingo discloses precipitating and filtering the polystyrene while stirring but is silent on suspending the polystyrene in the non-solvent and continuous extraction. The non-solvent will necessarily bring the polystyrene out of solution into a suspension and since the polystyrene is being separated from the liquid by filtration, it is being continuously extracted, since a filter will continuously allow the liquid to be drained from the solid, reading on Applicant's claim.

**Claim 23 - 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shingo (JP 11080418) in view of Cohen (4,405,394) and further in view of Masahide (JP 11005865).**

Shingo's and Cohen's disclosure is discussed above and is incorporated herein by reference.

**Masahide** discloses (abstract, [0007], claim 1) the use of carbonates of the formula shown below as solvents for foamed polystyrene,



where X and Y are each an integer of 0 – 2, preferably zero, and R<sup>1</sup> and R<sup>2</sup> are each an alkyl with 1 - 16 carbon atoms, cycloalkyl, etc. These values correspond to applicant's dialkyl carbonate when Masahide's X and Y are zero, and encompass applicant's R<sub>1</sub> and R<sub>2</sub> values of 2 – 15, 1 – 8, and the sum of between 2 – 15 and 5 – 10. Masahide also discloses ([0015]) the use of two or more of the above solvents, corresponding to applicant's claim of a blend of dialkyl carbonates.

Masahide discloses ([0013]), among others, dialkyl carbonates selected from the group consisting of diethyl carbonate, di-n-butyl carbonate, di-isobutyl carbonate and di-n-propyl carbonate, as claimed by applicant, with flash points of greater than 21°C and preferably greater than 70°C (abstract, [008], claims 3 and 4).

Masahide discloses ([0025], examples in [0033] and table 3 in [0034]) a dissolution temperature of 70°C or less, corresponding to applicant's range.

Shingo discloses using diethyl acetate as the solvent but fails to disclose di-butyl carbonate or di-propyl carbonate. However, it would have been obvious to one of ordinary skill in the art to have substituted Shingo's diethyl carbonate with Masahide's di-butyl and di-propyl carbonates since they are homologues of each other and provide the same purpose of dissolving the polystyrene in order to recover it and, further, Masahide discloses that either one can be used alone or in combination.

Shingo is silent on the flash point of the dialkyl carbonate. However, the flash point is an inherent property of the dialkyl carbonate. Additionally, Masahide discloses flash points preferably greater than 70°C. it would have been obvious to one of ordinary skill in the art to have used Masahide's dialkyl carbonates with flash points greater than 70°C in Shingo's process for the same purpose of dissolving polystyrene.

**Claims 42 - 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shingo (JP 11080418) in view of Cohen (4,405,394) and further in view of Peters (US 5,232,954).**

Shingo's and Cohen's disclosure is discussed above and is incorporated herein by reference.

**Peters** discloses (abstract, column 2, lines 55 – 60) the process of recovering an expanded thermoplastic resin, such as polystyrene, by dissolving it in a solvent, such as carboxylic esters (column 3, lines 13 – 27), removing impurities (column 4, lines 39 – end) and precipitating the polystyrene from the solution by adding alcohol (column 4, lines 25 – 34).

Peters discloses (column 5, lines 3 – 10) agitating the polystyrene and the solvent at ambient temperature, corresponding to applicant's claim of stirring the system at temperatures between 20 – 70°C. Peters discloses a temperature for the precipitation that is proper to allow for the precipitation of the polyester, preferably from 20 – 50°C, which fall within applicant's range of 10 – 70°C.

Peters discloses (column 5, lines 51 – 51, column 6, lines 29 – 31) various methods of separating the polystyrene, including using paper, cloth or metal filter or a double-vented twin-screw extruder, corresponding to applicant's claim.

Peters discloses (column 5, lines 11 – 16, 20 – 24 and 50 – 51) drying the precipitate by evaporation or vacuum distillation and heated to a temperature of about 110 – 120°C. Peters' temperature falls within applicant's temperature range and his vacuum distillation reads on the pressures claimed by applicant of below 760 mm Hg.

Shingo is silent as to the temperature and pressure of the drying step. However, it would have been obvious to one of ordinary skill in the art to have used Peters' temperature and pressure to carry out Shingo's procedure for the same purpose of filtering and drying the recovered polystyrene since they are both precipitating the same polymer with the same non-solvent by the same method.

Shingo is silent as to the use of extruders after filtration. However, it would have been obvious to one of ordinary skill in the art to have put Shingo's recycled polystyrene in Peters' extruder since both recycled polymers are the same polystyrene and made by the same method and would therefore be able to be extruded in the same manner.



***Response to Arguments***

Applicant's arguments filed 7/6/09 have been fully considered but they are not persuasive.

Applicant submits that the Examiner erred in concluding in the Advisory Action that the application does not deal with polystyrene, which it does.

Examiner respectfully disagrees with Applicant's interpretation of the Advisory Action: Examiner meant to explain that the independent claims do not claim the manner in which the polystyrene is being used, whether it is to make a stand-alone object, to be used in fabrics, as a laminating layer, etc. The Application, as written, concerns with a method to dissolve and to precipitate polystyrene.

Applicant submits that Shingo discloses the precipitation of PS with a lower alcohol as the sole non-solvent.

Applicant's argument is not convincing. Cohen teaches that alcohols and alkylene carbonates are typical non-solvents that can be used interchangeably or in combination. Therefore, Shingo's alcohol can be replaced with Cohen's alcohol and alkylene carbonate.

Applicant submits that Cohen describes a process for laminating a photosensitive layer made of a thermoplastic onto as substrate; that PS and alkylene carbonate and alcohol are listed among a plethora of various polymers and solvents or non-solvents.

Applicant's arguments are not convincing. Cohen is used herein to simply show that alcohols and alkylene carbonates and their combinations are grouped together and

known to act similarly. Since Shingo discloses using alcohols, one of ordinary skill in the art would have known to use it in combination with an alkylene carbonate for the same purpose of precipitating PS. The PS in Cohen is being used for a particular purpose, i.e., as a layer onto a substrate. In the process, alcohol and/or alkylene carbonate are used for the same purpose. As such, one can look at Cohen to substitute alcohol with a mixture of alcohol and alkylene carbonate. Regarding the plethora of polymers: Cohen specifically uses polystyrene in example 1.

Applicant submits that Masahide describes a carbonate compound for dissolving PS.

Applicant's argument is not convincing. Masahide clearly and specifically discloses the same dialkyl carbonates as claimed by Applicant. See, for example, [0013].

Applicant submits that Peters discloses the precipitation of PS with an alcohol as the sole non-solvent.

Applicant's argument is not convincing. Peters is used herein to show that in a typical process of drying, one increases the temperature and lowers the pressure. Peters is drying the same PS that was dissolved in a solvent and precipitated in alcohol as disclosed by Shingo. Therefore, one of ordinary skill in the art would have known to dry Shingo's recovered PS at higher temperatures and lower pressures as claimed by Applicant.

Applicant claims that a prima facie case of obviousness on the ratio of non-solvent to solvent has not been established in Shingo.

Applicant's argument is not convincing. Shingo discloses in the example a ratio of 3:1, reading on Applicant's claim. Shingo is silent as to a ratio in the body of the specification prior to the example, implying that any ratio that precipitates the polymer can be used. A person of ordinary skill in the art would know how much non-solvent to add, through routine experimentation, in order to precipitate the polymer.

Applicant submits unexpected results with example 22 using approximately 2.8 moles of butanol and 2 moles of propylene carbonate as non-solvents compared to comparative example 20 where only butanol is used.

Applicant's argument is not convincing. The showing is not commensurate in scope with the claims:

(1) Applicant claims in claim 21 alkaline carbonate alone or in combination with alcohol. The showing is only for the combination of both, not for alkylene carbonate alone as the non-solvent.

(2) Applicant claims in claim 21 any alkylene carbonate as the non-solvent. The showing is only for propylene carbonate.

(3) Applicant claims in claim 21 any ratio between the alcohol and the alkylene carbonate, which comprises a broad range from 0.0001% to 99.999% alkylene carbonate or alcohol. The showing is only for a 2.8:2 ratio.

#### ***Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to FRANCES TISCHLER whose telephone number is

(571)270-5458. The examiner can normally be reached on Monday-Friday 7:30AM - 5:00 PM; off every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jim Seidleck can be reached on 571-272-1078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ling-Siu Choi/  
Primary Examiner, Art Unit 1796

Frances Tischler  
Examiner  
Art Unit 1796

/FT/

